Saskatchewan Health

Fall Injuries Among Saskatchewan Seniors,

1992/93-1997/98

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FALL INJURIES AMONG SASKATCHEWAN SENIORS, 1992/93-1997/98: IMPLICATIONS FOR PREVENTION

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INFORMATION TO THE READERS OF FALL INJURIES AMONG SASKATCHEWAN SENIORS

Saskatchewan Health is pleased to provide you with information on fall injuries among Saskatchewan seniors from 1992/93 to 1997/98.

In this report, a fall hospitalization refers to a hospital stay that occurred because of a fall injury. One fall event may result in one or more hospitalizations. A fall episode refers to a fall event that resulted in at least one or a sequence of hospitalizations. Falls were categorized in several ways including age group, sex, and the place of occurrence. The term seniors has been used throughout the report to represent individuals aged 65 years and older.

Two different types of rates were used to summarize the findings among health districts. Each rate has a purpose or role in interpreting the data. The crude rate shows the actual experience or burden of falls among seniors within each health district. When assessing needs or evaluating programs, this is the rate that should be assessed. The age-sex adjusted or standardized rate was also reported. This age-sex adjusted rate permits a comparison among health districts that may have different proportions of seniors, although it may not be meaningful from a program perspective in districts such as the north where there is a small population and a small proportion of seniors.

It is hoped that the above notes will make the report more understandable and easier to use. We continue to welcome and appreciate your comments and suggestions.

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EXECUTIVE SUMMARY

Background

Fall injuries are a serious health issue for seniors, often resulting in long-term disability, loss of independence and even death. In addition to significant personal costs, fall injuries among seniors are associated with significant community/societal costs. As Saskatchewan's population continues to age, falls will contribute to an even greater burden of morbidity and mortality. The purpose of this study is to gain insight into the nature and scope of falls in our Saskatchewan seniors by exploring demographic and regional factors to support the development of local prevention and intervention programs.

Introduction

The study population for this study included all Saskatchewan residents aged 65 years and over who were eligible for health insurance benefits at any point between April 1, 1992 and March 31, 1998. All records for fall injuries in the senior population were from the hospital separation database. Analyses were done on selected variables available on the hospital separation record (e.g., sex, age, place of occurrence, E-codes (external cause of fall), etc.). In this study, a fall episode refers to a fall event that resulted in at least one or a sequence of hospitalizations.

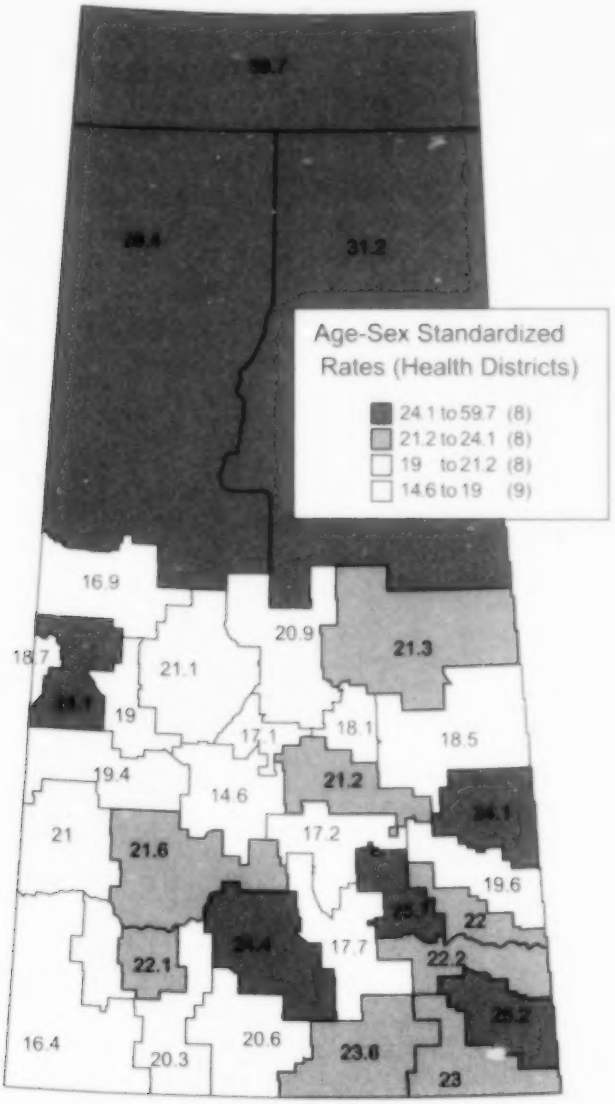
Major Findings:

- **Hospital separations for falls:** In the six-year study period, 18,318 fall hospital separations, averaging, 3,053 separations per year and an average rate of 21.1 per 1,000 seniors population (page 16).
- **Falls episodes:** 16,965 fall episodes were recorded in the six-year study period (1992/93 to 1997/98). This corresponds to an average of 2,827 fall episodes per year, and an average rate of 19.5 falls per 1,000 senior population (pages 16 and 17).
- **Seniors affected:** The number of seniors hospitalized for fall-related injuries was 14,691, averaging 2,449 per year, and an annual average rate of 16.9 admissions per 1,000 senior population (page 27).
- **Trends:** The rate of episodes in seniors has decreased over the six-year study period by 17.3% (pages 16 and 17).

Other Findings:

- For each fall, there are 1.08 separations (page 27).
- Fall hospitalizations account for approximately 5.0% of all senior hospitalizations (page 17), and 77% of all injury hospitalizations.
- Twice as many females are hospitalized for falls as are males (page 19).
- The number of fall hospitalizations increases to age 65-84 and then declines, but the fall hospitalization rate increases steadily with age (page 18).
- The most common cause of falls in seniors (34.1%) was "falling on the same level from slipping, tripping or stumbling" (page 19).
- Almost half (49%) of falls occurred within the home (page 20).
- No significant differences in incidence of falls among the seasons were noted (page 21).
- The calculated crude fall episode rates differed widely across the health districts (14.5 to 34.2 fall episodes per 1,000 population over 65 years of age) (page 30).
- Episode rates also varied across health regions (18.6 to 27.1 per 1,000 population over 65 years of age) (page 32).
- The average length of stay in hospital varied extensively among health districts, ranging from 6.1 to 21.4 days per admission for falls (page 29).

Average Annual Age-Sex Standardized Fall Episode Rates (per 1,000 per year) in Seniors by Health District, Saskatchewan. 1992/93-1997/98.



*Standardized using the 1994 covered Saskatchewan population

Limitations

This study was restricted to information contained in the hospital separation database. Falls that did not result in a hospital stay were therefore excluded. Factors that are not recorded on hospital separation records such as previous medication use and social factors could not be investigated. There were also some limitations inherent in the coding system used, such as inability to determine the senior's place of residence at the time of a fall and vague information about the circumstances of the fall.

Policy Implications

- This report will facilitate the recognition of fall-related injuries among seniors as a public health problem that requires a comprehensive prevention program.
- One of the first steps in the development of a comprehensive prevention program is the establishment of a surveillance system for unintentional injuries.

Next Steps

This report will be distributed to all health districts and injury prevention stakeholders within the province for health program planning. It will also be shared with other jurisdictions such as Provincial, Territorial and Aboriginal health authorities as well as the federal government.

The information provided on the numbers of falls, circumstances and outcomes of falls, district rates, sex and age-group differences, and trends can be used to develop or appropriately tailor fall prevention programs at the local level. Continued research and partnerships with appropriate stakeholders are essential steps in the prevention of falls among seniors in Saskatchewan.

Fall injuries are a serious health issue for seniors, often resulting in long-term disability, loss of independence and even death.

INTRODUCTION

It is recognized that injuries due to falls are a major public health problem especially among seniors (aged 65 years and older). Falls account for a substantial proportion of all injuries and are a leading cause of death in Canada. A Canadian study by Riley and associates (5) reported that in 1989, for those aged 65 and older, unintentional falls accounted for 65% of all injury-related hospital separations, 72% of injury-related days of hospital care, and 56% of injury deaths. According to a study in British Columbia, approximately 30% of seniors living in the community fall at least once a year (1). This number increases to over 40% for those aged 75 and older (2). For those living in long-term care homes, the percentage of individuals experiencing a fall is 50% (1).

Falls among seniors often result in moderate to severe injuries. The most frequent type of hospitalized injury is orthopaedic (mainly fractures and dislocations) (3). Of those seniors hospitalized for fall injuries, almost half will have sustained a fracture of the hip (5).

The outcomes of fall injuries among seniors tend to be serious and often result in disability or graduated loss of independence or death. The outcomes are not limited to physical trauma but include social withdrawal, psychological trauma and increased dependence (9). Falls can decrease self-confidence and up to 25% of those who have fallen limit their daily activities because they fear falling again (10). The risk of falling is higher among subjects with previous falls (4). Multiple falls in seniors may be an indication of underlying conditions that could increase the risk of functional dependency or death within the next few years (11).

Falls among seniors have a significant impact on the health care system in Canada. They are the leading cause of injury hospitalizations among seniors in Saskatchewan and in Canada (3,6). Falls account for 77% of all injury-related hospital admissions for seniors in Saskatchewan (6).

Hospitalizations due to fall injuries result in considerable health expenditures. The estimated cost to Canadians in 1995 for fall injuries among seniors was $980 million (7). This includes both direct and indirect costs; the former includes institutional expenditures and professional costs whereas the latter includes social costs due to premature mortality and disability (1,7). One important direct cost factor that can be further analyzed is the average length of hospital stay for fall hospitalizations.

The health consequences and costs of falls among seniors will increase as the population continues to age, and the total seniors population is expected to grow both nationally and provincially. Seniors currently represent a substantial segment of the Saskatchewan population; in 1999, 14.5% (19) of the total population was aged 65 years and older. This percentage is much higher in Saskatchewan than in other provinces, such as Alberta, where seniors account for only 9.5% of the population. Thus, falls among seniors will continue to be an important issue in Saskatchewan in the future.

Developing effective fall prevention and intervention strategies requires a thorough and comprehensive understanding of both the incidence and nature of falls among seniors and the factors associated with falls among seniors. Both intrinsic and extrinsic factors have been associated with an increased risk of falls among seniors (1). Age is one intrinsic factor already mentioned; others linked to an increased risk of falling include use of medication (14), mobility impairment (15) and cognitive impairment (1). Extrinsic factors associated with an elevated risk of falling include various features of the physical environment such as poor lighting, stairs and a lack of handrails. Extrinsic factors have been implicated as greater risk factors for the 60-74 age group with intrinsic factors being more common causes for the 75 plus age group (52).

Administrative data sources such as hospitalization data are both a common and an effective tool for describing the epidemiology of falls among the senior population. Falls among seniors are often serious and require hospitalization. Therefore, it was assumed that the use of hospitalization data would include the majority of falls among seniors. This hospitalization data would then enable comparisons to be made with other research studies as a means of understanding the scope of this issue for Saskatchewan seniors.

Fall outcomes are not limited to physical trauma but include social withdrawal, psychological trauma and increased dependence.

GOAL OF STUDY

The goal of this study is to support independent and healthy living in Saskatchewan seniors by providing health districts and other stakeholders with information that can be used to plan fall prevention and intervention programs for seniors. A coalition of stakeholder groups was formed initially to assist with the interpretation and dissemination of the data.

OBJECTIVES

The following specific research objectives were developed for this study:

- To describe and compare hospitalization rates by health district, age group, sex, nature of fall and place of fall for each year of study.
- To investigate the seasonal variation of falls and fall injuries.
- To categorize and summarize procedures and discharge type.
- To calculate the average annual number of fall hospitalizations for the six-year study period 1992/93-1997/98 and for each year within the study period.
- To estimate the incidence of fall injuries among seniors in Saskatchewan and regional variations in the incidence rates.

Seniors represent a substantial percentage of the Saskatchewan population. As our population continues to age, falls will carry an even greater burden of morbidity and mortality.

METHODS

Study Population

The study population includes all Saskatchewan residents aged 65 and over who had coverage at any point during the period from April 1, 1992 to March 31, 1998. Saskatchewan has a publicly funded health care system. Nearly all of Saskatchewan's approximately one million residents are eligible for coverage by health insurance benefits (the "covered population"). Excluded from coverage are those individuals whose health care is fully funded federally. This category, which accounts for less than 1% of the total population, includes members of the Royal Canadian Mounted Police, members of the Canadian Forces and inmates of federal penitentiaries.

Data Source

All records of fall injury hospitalizations in the senior population were selected from the hospital separation database.

Definition of Terms

A fall **hospitalization** refers to a hospital stay that occurred because of a fall injury. A fall **episode** refers to a fall event that resulted in at least one or a sequence of hospitalizations. One episode includes the initial hospitalization and any subsequent hospitalizations/transfers that may have occurred. For example, if a senior was hospitalized for a fall, admitted to Hospital X, transferred to Hospital Y, and later transferred to Hospital Z, this would be counted as one episode, but three hospitalizations.

The term **senior** has been used throughout the report to represent an individual aged 65 years and older. It is recognized that there are inconsistencies with other groups using various terms such as older persons and older adults. The term senior was chosen for this report based upon an informal survey of over 50 individuals 65 years of age and older in a Saskatchewan Seniors group who preferred the term senior.

A **fall** is defined in the International Classification of Diseases - Ninth Revision (ICD-9 codes) as, "an unexpected event wherein a person fell to the ground from an upper level or from the same level and including falls on stairs and onto a piece of furniture" (20).

Data Analysis Techniques

Records were first collapsed using the health services number and date of admission to obtain a single record for each fall episode.

A number of analyses were conducted using selected variables contained on the hospital separation record including sex, age group, place of occurrence, admission type, discharge type, diagnoses, and procedures.

Data were grouped according to sex and by the following age groups (65-69, 70-74, 75-79, 80-84 and 85 and over) and compared.

Falls were categorized according to the external cause (E-codes) and the place of occurrence. The E-codes provide information about environmental events, circumstances, and conditions.

Seasonal variations were investigated by grouping the fall hospitalizations by the month of admission. The following mutually exclusive categories for seasons were used (December to February, March to May, June to August and September to November).

Fall episodes were categorized by admission and discharge type. Data were grouped into three admission categories (emergency, urgent and elective). These admission categories describe the mode of entry into the hospital. 'Emergency' is not necessarily life threatening, but refers to the use of the emergency department before hospital admission. 'Urgent' requires treatment but is non-life threatening. 'Elective' is an admission by previous appointment. Eight discharge categories were used (medical discharge, transfer to other hospital, transfer to nursing home, death certification without autopsy, transfer to geriatric centre, death certification with autopsy, discharge without medical authorization and other). 'Medical discharge' is authorized by a health care professional. 'Without medical authorization' is a voluntary discharge by a patient or relative against the advice of the attending caregiver.

The diagnoses were grouped into categories using the ICD-9 chapters. The chapters are a numeric listing of diagnostic codes and descriptions that classify diseases of body systems, poisonings and injuries. The diagnoses from the first hospitalization were used if the patient was consequently transferred to another hospital.

Procedures performed during fall hospitalizations were grouped into categories using the Canadian Classification of Procedures (CCP). Procedures that occurred during hospitalization for fall injuries are described. These categories consist of procedures on the body systems and the modes of treatment (diagnostic procedures, surgery and therapeutic procedures).

Lengths of stay (LOS) and the average length of stay (ALOS) were calculated for hospital admissions for falls. LOS was calculated by subtracting the date of first admission from the date of the final discharge. ALOS was calculated as the total LOS divided by the total number of fall admissions.

Health district residence at the time of hospitalization was used to describe variations in fall injuries across the province. Each hospital separation is assigned a single residence code, a five-digit numeric code that uniquely identifies each city, town, village, rural municipality (RM) and Registered Indian status in Saskatchewan. These residence codes can then be grouped into health districts. In this manner, cities, towns and villages are assigned to a single health district.

However, when the border surrounding a RM falls into more than one health district, the RM is apportioned among districts, such that the RM's population is divided among districts in proportion to the RM's land area. This can result in fractional values for the total number of fall separations in a health district.

Regional variation information is also provided for Regional Health Authorities (RHAs) in Saskatchewan. At the time of publication, the boundaries for these RHAs had been established, but the actual administrative formation was still in progress. These 12 RHAs will replace the existing 32 health districts.

Descriptive statistics such as percentages, ratios, and means were used throughout the report. Rates were calculated for Saskatchewan's covered seniors population for the specified periods. Both crude and age-sex standardized rates were calculated for the health district analysis. Crude rates were calculated and reported for each health district because they show the actual experience or burden of falls among seniors. Because of variations in the proportion of seniors in health districts, rates were also age-sex standardized for each health district. This permits a fair comparison between different health districts and over time.

The cost of falls is high both to individuals and to the community. Since many falls are preventable, investing in effective intervention programs makes good sense.

RESULTS

In the six-year study period (1992/93 to 1997/98), there were 18,318 fall hospital separations, averaging 3,053 per annum. The annual rate of hospitalization due to fall injuries in the study period was 21.1 per 1,000 population 65 years of age and older. Hospitalizations for fall-related injuries were approximately twice as high for females (69%) than males (31%), and increased with age. The annual fall-related mortality rate was 110 deaths per 100,000 population 65 years of age and older. By collapsing the data by Health Service Number (HSN) and date of admission, the number of fall episodes was calculated. There were 16,965 fall episodes within the province during the study period. The annual rate of fall episodes was 19.5 per 1,000 population 65 years of age and older. Approximately 49% of fall episodes occurred within the home.

Time Trends

Over the six years, we calculated an average of 2,827 fall episodes per year (Figure 1). There was a decrease in the number of episodes and the episode rate during the study period (Table 1). The largest number of fall episodes occurred in 1992/93 (3,026). The least number of fall episodes occurred in 1997/98 (2,601), a decrease of 6.6% compared to the 1992/93 number of fall episodes. There was a significant difference in the number of episodes per year within the six-year study period ($p<0.001$).

Figure 1: Annual Number of Fall Episodes among Saskatchewan Seniors, 1992/93-1997/98.

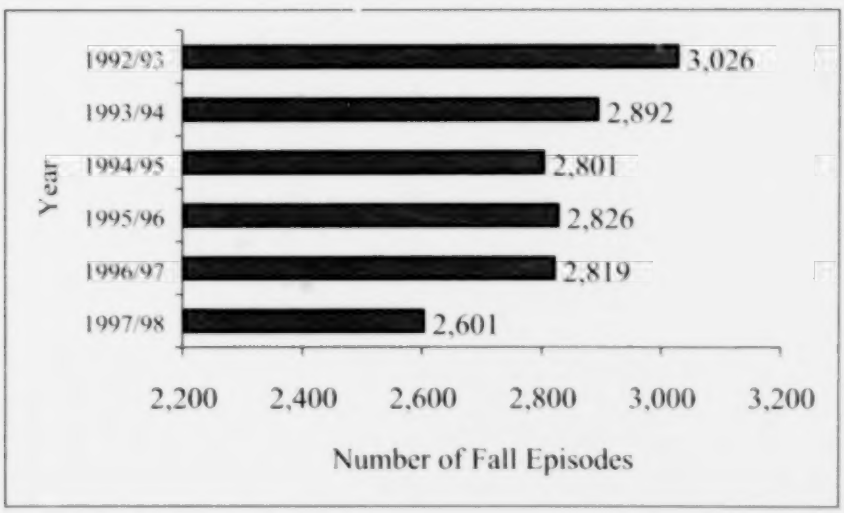


Table 1: Annual Fall Episode Rates among Saskatchewan Seniors, 1992/93-1997/98.

YEAR	EPISODES	SENIOR POPULATION	EPISODE RATE (PER 1,000)
1992/93	3,026	141,805	21.3
1993/94	2,892	143,601	20.1
1994/95	2,801	144,765	19.3
1995/96	2,826	146,145	19.3
1996/97	2,819	147,740	19.0
1997/98	2,601	147,622	17.6

Table 2 shows the annual variations in the proportion of falls hospitalizations. Fall hospitalizations as a proportion of all hospitalizations among people 65 years and older showed an increasing trend between 1992/93 and 1995/96, but remained somewhat stable between 1995/1996 and 1997/98. However, the number of fall-related hospitalizations and all hospitalizations showed a decreasing trend during the study period.

Table 2: Annual Proportions of Fall Hospitalizations in Saskatchewan Seniors, 1992/93-1997/98.

YEAR	FALL HOSPITALIZATIONS	ALL HOSPITALIZATIONS	PROPORTIONS OF FALL HOSPITALIZATIONS
1992/93	3,123	70,148	4.5%
1993/94	3,126	65,440	4.8%
1994/95	3,035	59,046	5.1%
1995/96	3,031	57,629	5.3%
1996/97	3,053	57,848	5.3%
1997/98	2,945	57,358	5.1%
TOTAL	**18,318**	**367,469**	**5.0%**

Age Distribution

Data were compared over five-year age-groups. Table 3 describes the fall episode rates by age groups. The rate of fall episodes increased with age. Seniors who were 90 years or older were approximately 10 times more likely to experience fall episodes than seniors between the ages of 65 and 69 years. There was a significant difference in the number of fall episodes among the age groups ($p<0.001$).

Table 3: Fall Episodes in Seniors by Age Group, Saskatchewan, 1992/93-1997/98.

AGE GROUP	TOTAL NUMBER OF FALL EPISODES (1992/93-1997/98)	COVERED POPULATION (1994)	AVERAGE EPISODE RATE (PER 1,000 PER YEAR)
65-69	1,729	40,446	7.1
70-74	2,377	37,122	10.7
75-79	3,200	29,643	18.0
80-84	3,932	20,825	31.5
85-89	3,319	11,008	50.3
90-94	1,826	4,471	68.1
95+	582	1,250	77.6
TOTAL	**16,965**	**144,765**	**19.5**

Comparisons by Sex

Over twice as many females are hospitalized for falls as males (Figure 2). The rate of fall episodes was significantly higher in females than males throughout the six-year study period ($p<0.001$) (Table 4). The ratio of female to male fall episodes was 2.2:1. The average rate of fall episodes among females was higher, with 23.8 episodes per 1,000 population per year, compared with the average rate of 13.9 per 1,000 population per year for males.

Figure 2: Percentage of Fall Episodes in Seniors by Sex, Saskatchewan, 1992/93-1997/98.

Table 4: Fall Episode Rates (per 1,000) in Seniors by Sex, Saskatchewan, 1992/93-1997/98.

	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	AVERAGE RATE
Male	15.9	14.5	13.6	13.5	13.5	12.3	13.9
Female	25.6	24.5	23.8	23.9	23.4	21.8	23.8
Total	21.3	20.1	19.3	19.3	19.0	17.6	19.5

Circumstance of Fall

Data were summarized by external cause of fall. The external cause describes the type of fall such as a fall from a chair or a fall from slipping or tripping. 'Fall on same level from slipping, tripping or stumbling' accounted for 34.1% of falls. A fairly large proportion (42.8%) of falls were grouped into the category 'other and unspecified fall'. This category includes falls of an unknown nature, as well as falls that do not come under a pre-existing category.

Place of Occurrence

Data were summarized by the place where the injury occurred (Table 5). Over 7 out of every 10 falls had occurred in places of residence, including homes (48.5%) and residential institutions (23.7%). Industrial premises were the least frequent place for a fall to occur.

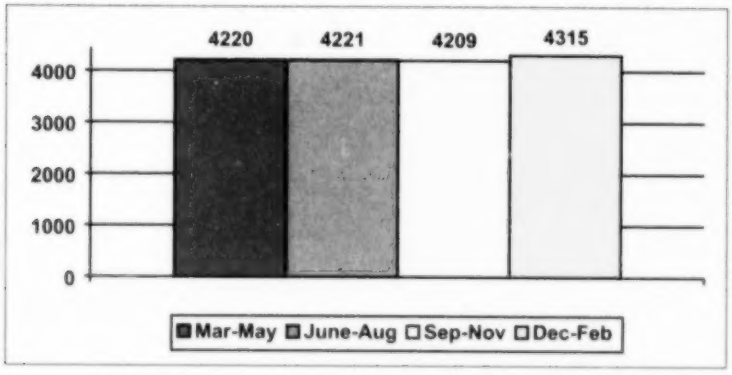
Table 5: Fall Episodes in Seniors by Place of Occurrence, Saskatchewan, 1992/93-1997/98.

DEFINITION	FREQUENCY	PERCENT
Home	8,220	48.5
Residential institution	4,021	23.7
Street/highway	674	4.0
Public building	619	3.6
Farm	128	0.8
Place for recreation/sport	122	0.7
Industrial place/premises	20	0.1
Other specified place	143	0.8
Unspecified place	3,018	17.8
TOTAL	**16,965**	**100.0**

Seasonal Variation

The total number of episodes in the six-year period was summarized into four pre-determined seasons as described in the methods section. The number of episodes was slightly higher in winter than in the other seasons (Figure 3). However, there were no significant differences in falls among the seasons ($p>0.05$).

Figure 3: Fall Episodes among Seniors by Season, Saskatchewan, 1992/93-1997/98.



Admission Type

Three admission categories (emergency, urgent and elective) were analysed. Emergency is not necessarily life threatening, but refers to the use of the emergency department before hospital admission. Urgent requires treatment but is non-life threatening. Elective is an admission by previous appointment. Entry through emergency was the most frequent mode of admission at 58.2%, with slightly more females entering through emergency than males. Elective admissions accounted for only 10% of all fall admissions (Table 6).

Table 6: Fall Episodes in Seniors by Admission Type and Sex, Saskatchewan, 1992/93-1997/98.

ADMISSION TYPE	MALE (%)	FEMALE (%)	TOTAL (%)
Emergency	2,927 (55.3)	6,945 (59.5)	9,872 (58.2)
Urgent	1,709 (32.4)	3,553 (30.4)	5,262 (31.0)
Elective	615 (11.6)	1,122 9.6)	1,737 (10.2)
Unknown	39 (0.7)	55 (0.5)	94 (0.6)
TOTAL	**5,290 (31.2)**	**11,675 (68.8)**	**16,965 (100)**

Discharge Type

Data were grouped by discharge type (Tables 7 and 8). Over half (58.2%) of all discharges for fall injuries were medical discharges (authorized discharge by a health care professional). 'Medical' discharges assume that patients were sent home by a care-giver fully recovered or to continue recovery at home. Transfers to other hospitals and to nursing homes were responsible for 17.2% and 14.6% of discharges, respectively. Approximately 5.6% of the fall-related injuries resulted in death. The 'other' category is a group of several minor discharge types.

Table 7: Fall Episodes in Seniors by Discharge Type, Saskatchewan, 1992/93-1997/98

DISCHARGE TYPE	FREQUENCY	PERCENT
Medical	9,872	58.2
Transfer to other hospital	2,919	17.2
Transfer to nursing home*	2,469	14.5
Death without autopsy	858	5.1
Transfer to geriatric centre	507	3.0
Death with autopsy	97	0.6
Without medical authorization	25	0.1
Other	218	1.3
Total	**16,965**	**100.0**

Falls can decrease self-confidence. Up to 25% of those who have fallen limit their daily activities because they fear falling again.

Table 8: Fall Episodes in Seniors by Discharge Type and Sex, Saskatchewan, 1992/93-1997/98

DISCHARGE TYPE	MALE (%)	FEMALE (%)	TOTAL (%)
Medical	3,105 (58.7)	6,767 (58.0)	9,872 58.2)
Transfer to other hospital	917 (17.3)	2,002 (17.1)	2,919 (17.2)
Transfer to nursing home*	584 (11.1)	1,885 (16.1)	2,469 (14.5)
Death without autopsy	403 (7.6)	455 (4.0)	858 (5.1)
Transfer to geriatric centre	155 (2.9)	352 (3.0)	507 (3.0)
Death with autopsy	60 (1.1)	37 (0.3)	97 (0.6)
Without medical authorization	14 (0.3)	11 (0.1)	25 (0.1)
Other	52 (1.0)	166 (1.4)	218 (1.3)
Total	**5,290 (31%)**	**11,675 (69%)**	**16,965 (100%)**

* New or returning residents

Hospital Procedures Performed

Seventy-nine percent of the fall patients had a primary diagnosis in the 'Injury and Poisoning' category. The procedures performed during hospitalization for fall injuries were classified as principal, secondary or other. The 'principal' procedure performed for a patient should be related to the primary diagnosis. 'Secondary' procedures performed are not directly related to the primary diagnosis but may contribute to hospital stay. 'Other' procedures are not related to the primary diagnosis and do not affect hospital stay.

As Table 9 indicates, 9,888 principal procedures were performed during the study period. Approximately 75% of the principal procedures were classified under operations on the musculoskeletal system, such as repairing a muscle or tendon, or fixing a bone. About 14% were classified as 'Certain Diagnostic and Therapeutic Procedures', and four percent were 'Operations on the Skin'. These top three procedures accounted for 93% of the principal procedures performed.

Table 9: Principal Procedures Performed During Hospitalization for Fall Injuries in Seniors, Saskatchewan, 1992/93-1997/98.

PRINCIPAL PROCEDURE PERFORMED	NUMBER	PERCENT
Operations on the Musculoskeletal System	7,399	74.8
Certain Diagnostic and Therapeutic Procedures	1,336	13.5
Operations on the Skin and Subcutaneous Tissue	421	4.3
Other procedures	732	7.4
TOTAL	**9,888**	**100.0**

Average Length of Stay (ALOS)

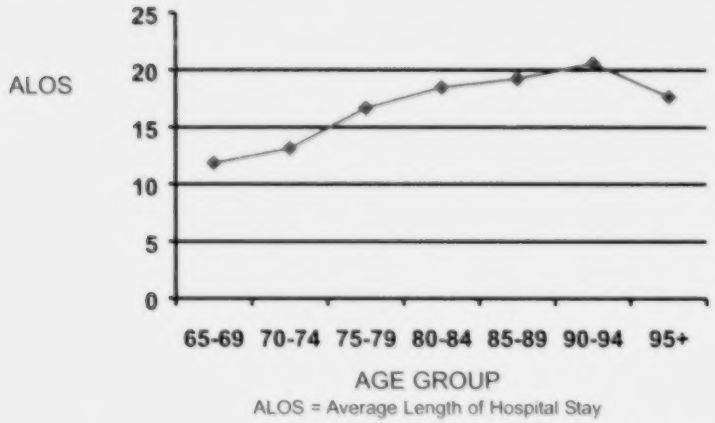
The ALOS was calculated as the total LOS divided by the total number of fall admissions. LOS was calculated by subtracting the date of first admission from the date of the final discharge. The average length of stay for fall episodes was 16.0 days. The ALOS for males and females were very similar. The ALOS for fall episodes increased with increasing age (Figure 4). The 65-69 age group had an ALOS of 11.8, while the ALOS for the 95+ age group was 17.6 days. Almost half of those hospitalized for a fall (49.8%) had a LOS of more than 10 days (Table 10).

Table 10: LOS For Fall Episodes in Seniors, Saskatchewan, 1992/93-1997/98.

LOS	FREQUENCY	PERCENT
Under 6 days	4,616	27.2
6-10 days	3,904	23.0
11-30 days	6,366	37.5
$\geq$ 31 days	2079	12.3
Total	**16,965**	**100.0**

LOS = Length of Hospital stay

Figure 4: ALOS for Fall Episodes in Seniors by Age Group, Saskatchewan, 1992/93-1997/98.



Regional Variation

This section provides a description of the regional variation of falls among seniors within Saskatchewan. Health district/authority of residence is used when describing the number of fall episodes, hospitalizations and other related variables. A summary table is also provided with information at the Regional Health Authority level. At the time of publication, these Regional Health Authorities were being formed in Saskatchewan.

The number of fall episodes by health district was provided for the study period (Table 11). Two fiscal years of data have been combined to minimize the effects of random variations in the small districts. Fractional values occur in the table when hospital separations are apportioned to health districts on a fractional basis because of the sharing of RM's by more than one health district. Variations in the average number of falls/year correspond largely with variances in population of the districts. Total numbers of hospitalizations are compared to fall episodes in Table 12. Fall episodes include an initial hospitalization and any subsequent hospitalizations or transfers that may have occurred. The number of individuals within each health district that were hospitalized for a fall during the study period is also listed.

Table 11: Number of Fall Episodes in Seniors by Health District of Residence, Saskatchewan, 1992/93-1997/98.

HEALTH DISTRICT	1992/93 1993/94	1994/95 1995/96	1996/97 1997/98	TOTAL	AVERAGE NUMBER OF FALLS/YEAR
South East	175	153	169	497	82.8
South Central	217	185	185	587	97.8
South Country	130	93	83	306	51.0
Rolling Hills	96	76	87	259	43.2
Southwest	112	84	59	256	42.7
Moose Mountain	132	137	129	397	66.2
Pipestone	224	173	137	533	88.8
Regina	785	921	863	2,568	428.0
Moose Jaw/Thunder Creek	489	397	299	1,185	197.5
Swift Current	146	157	156	459	76.5
North Valley	145	145	170	460	76.7
Touchwood Qu'Appelle	122	123	138	382	63.7
East Central	261	256	244	760	126.7
Living Sky	107	97	126	330	55.0
Midwest	179	129	155	462	77.0
Prairie West	114	95	103	312	52.0
Assiniboine Valley	233	196	217	646	107.7
Central Plains	206	201	175	582	97.0
Saskatoon	714	714	675	2,103	350.5
Greenhead	105	108	92	305	50.8
Pasquia	140	112	115	367	61.2
North Central	115	78	77	270	45.0
Gabriel Springs	74	71	71	216	36.0
North-East	112	123	107	342	57.0
Prince Albert	259	290	289	839	139.8
Parkland	146	117	126	389	64.8
Battlefords	161	154	138	452	75.3
Twin Rivers	86	100	109	294	49.0
Lloydminster	31	33	19	83	13.8
Northwest	44	58	36	138	23.0
Mamawetan Churchill River	36	27	36	99	16.5
Keewatin Yatthé	19	23	33	75	12.5
Athabasca Basin	6	5	4	15	2.5
Total (Saskatchewan)	**5,918**	**5,627**	**5,420**	**16,965**	**2,827.5**

Table 12: Fall-Related Hospitalization by Health District of Residence, Saskatchewan, 1992/93-1997/98.

HEALTH DISTRICT	NUMBER OF EPISODES	NUMBER OF HOSPITALIZED INDIVIDUALS	TOTAL NUMBER OF HOSPITAL SEPARATIONS
South East	497	432	569
South Central	587	491	731
South Country	306	252	349
Rolling Hills	259	223	291
Southwest	256	223	267
Moose Mountain	397	317	468
Pipestone	533	462	591
Regina	2,568	2,259	2,588
Moose Jaw/Thunder Creek	1,184	988	1,259
Swift Current	459	404	512
North Valley	460	379	511
Touchwood Qu'Appelle	382	329	425
East Central	760	659	798
Living Sky	330	296	366
Midwest	462	387	497
Prairie West	312	263	351
Assiniboine Valley	646	555	701
Central Plains	582	498	638
Saskatoon	2,103	1,883	2,148
Greenhead	305	254	336
Pasquia	367	334	399
North Central	270	255	290
Gabriel Springs	216	201	240
North-East	342	300	372
Prince Albert	839	744	942
Parkland	389	326	420
Battlefords	452	397	494
Twin Rivers	294	234	319
Lloydminster	83	70	86
Northwest	138	119	147
Mamawetan Churchill River	99	87	114
Keewatin Yatthé	75	58	84
Athabasca Basin	15	12	15
Total (Saskatchewan)	**16,965**	**14,691**	**18,318**

The ALOS for seniors hospitalized for fall injuries was calculated for each health district (Table 13). ALOS is calculated using the date of the first admission and the date of the final discharge and thus includes transfers. The ALOS varies greatly among the health districts. The shortest ALOS was 6.1 days (Athabasca Basin Health Region). The longest ALOS was 21.4 days (Prince Albert Health District).

Both crude and age-sex standardized rates were calculated. Crude rates were calculated and reported because they show the actual experience or burden of falls among seniors within a health district. Because of variations in the proportion of seniors, rates were also age-sex standardized for each health district. This permits a fair comparison between different health districts and over time.

Of the 32 health districts and one health authority, 21 had injury episode rates (both crude and age-sex standardized) higher than the provincial rate (Table 14 and Figure 5). The Athabasca Health Authority had the highest crude and average standardized episode rate. Although there were differences observed in the rates reported, there were no statistical differences found when comparing the individual health district rates to the provincial average.

The number of fall episodes and the number of individuals hospitalized were summarized by Regional Health Authority for the study period (Table 15). Crude fall episode rates were also calculated for each RHA.

Most Regional Health Authorities had crude fall episode rates that were higher than the provincial rate. The provincial rate is lower than most health regions because the two RHAs with the lowest crude fall episode rates also had the greatest population size. RHA 4 includes the city of Regina and RHA 6 includes Saskatoon.

Table 13: Average Length of Stay for Seniors Hospitalized for Fall Injuries by Health District of Residence, Saskatchewan, 1992/93-1997/98.

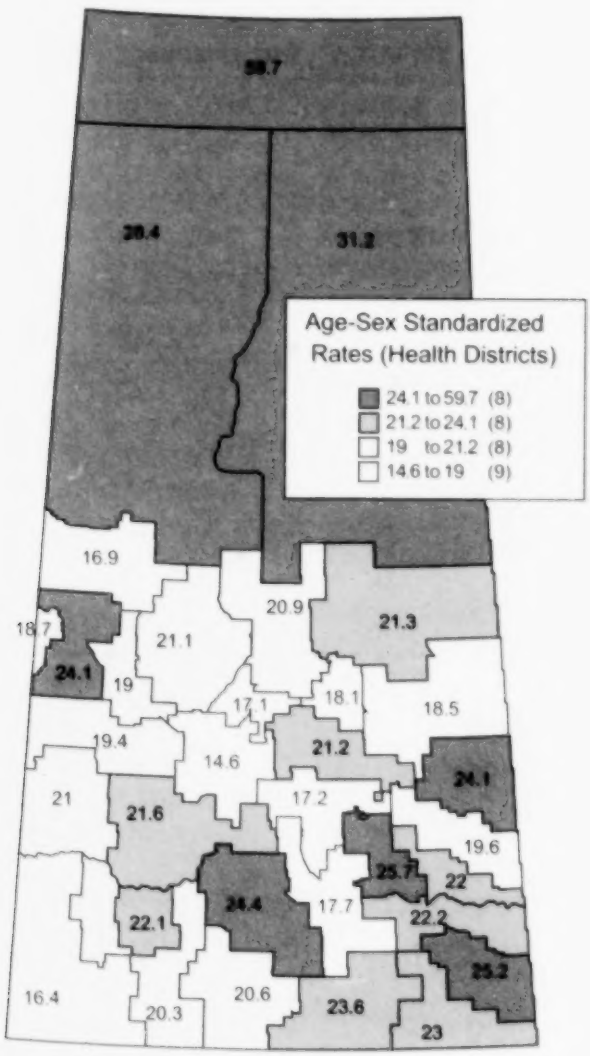
HEALTH DISTRICT	TOTAL DAYS	HOSPITAL SEPARATIONS	ALOS
South East	5,339	497	10.7
South Central	10,797	588	18.4
South Country	4,543	306	14.8
Rolling Hills	3,723	259	14.4
Southwest	3,500	256	13.7
Moose Mountain	4,361	397	11.0
Pipestone	7,220	533	13.5
Regina	53,140	2,568	20.7
Moose Jaw/Thunder Creek	24,054	1,184	20.3
Swift Current	8,511	459	18.5
North Valley	4,426	460	9.6
Touchwood Qu'Appelle	5,160	382	13.5
East Central	12,520	760	16.5
Living Sky	4,715	330	14.3
Midwest	5,558	462	12.0
Prairie West	4,550	312	14.6
Assiniboine Valley	7,332	646	11.4
Central Plains	7,738	582	13.3
Saskatoon	36,426	2103	17.3
Greenhead	3,050	305	10.0
Pasquia	4,323	367	11.8
North Central	3,907	270	14.5
Gabriel Springs	2,618	216	12.1
North-East	3,840	342	11.2
Prince Albert	17,977	839	21.4
Parkland	6,606	389	17.0
Battlefords	7,036	452	15.6
Twin Rivers	3,744	294	12.7
Lloydminster	1,311	83	15.8
Northwest	1,854	138	13.4
Mamawetan Churchill River	1,551	99	15.7
Keewatin Yatthé	518	75	6.9
Athabasca Basin	91	15	6.1
Total (Saskatchewan)	**272,037**	**16,965**	**16.0**

Table 14: Average Fall Episode Rates (per 1,000) for Seniors by Health District of Residence, Saskatchewan, 1992/93-1997/98.

HEALTH DISTRICT	AVERAGE CRUDE RATE (ANNUAL)	AVERAGE AGE-SEX *STANDARDIZED RATE (ANNUAL)
South East	21.4	23.0
South Central	24.9	23.6
South Country	19.4	20.6
Rolling Hills	20.0	20.3
Southwest	16.4	16.4
Moose Mountain	25.2	25.2
Pipestone	23.1	22.2
Regina	17.3	17.7
Moose Jaw/Thunder Creek	24.4	24.4
Swift Current	21.7	22.1
North Valley	22.7	22.0
Touchwood Qu'Appelle	24.8	25.7
East Central	20.3	19.6
Living Sky	17.7	17.2
Midwest	21.0	21.6
Prairie West	20.5	21.0
Assiniboine Valley	24.6	24.1
Central Plains	22.3	21.2
Saskatoon	14.5	14.6
Greenhead	19.4	19.4
Pasquia	18.5	18.5
North Central	18.8	18.1
Gabriel Springs	18.0	17.1
North-East	21.3	21.3
Prince Albert	20.6	20.9
Parkland	20.6	21.1
Battlefords	19.0	19.0
Twin Rivers	23.9	24.1
Lloydminster	18.6	18.7
Northwest	16.9	16.9
Mamawetan Churchill River	23.1	28.4
Keewatin Yatthé	27.1	31.2
Athabasca Health Authority	34.2	59.7
Total (Saskatchewan)	**19.5**	**19.5**

**Standardized using the 1994 covered Saskatchewan population*

Figure 5: Annual Age-Sex Standardized* Fall Episode Rates (per 1,000 per year) in Seniors by Health District, Saskatchewan, 1992/93-1997/98.



*Standardized using the 1994 covered Saskatchewan population

Table 15: Fall Episodes and Crude Fall Episode Rate by Regional Health Authority of Residence, Saskatchewan, 1992/93-1997/98.

RHA	NUMBER OF HOSPITAL SEPARATIONS	HOSPITALIZED INDIVIDUALS	NUMBER OF FALL EPISODES	AVG NUMBER OF FALL EPISODES	CRUDE AVG ANNUAL FALL EPISODE RATE
1	1768	1240	1481	246.8	23.7
2	1608	1240	1490	248.3	23.2
3	1070	850	974	162.3	19.6
4	3604	3050	3483	580.5	18.6
5	2010	1593	1866	311.0	22.2
6	3392	2878	3231	538.5	16.0
7	1184	904	1079	179.8	20.4
8	1061	889	979	163.2	19.5
9	1362	1070	1228	204.7	20.6
10	1046	820	967	161.2	19.8
11	114	87	99	16.5	23.1
12	84	58	75	12.5	27.1
Athabasca	15	12	15	2.5	34.2
Total (SK)	**18,318**	**16,965**	**14,691**	**2,827.5**	**19.5**

The risk of falling is higher among those who have had previous falls.

DISCUSSION

The main intent of this report was to describe factors associated with fall hospitalizations among seniors such as demography, time and geography and other characteristics of their falls in order to support preventive strategies.

Information about the place of occurrence is important in developing fall prevention strategies. This study has provided information on district of residence at time of fall, place where the fall occurred and the discharge destination. We do know from the data that 23.7% of falls occurred in a residential institution and that 14.6% of people were transferred or returned to a nursing home. However, a closer examination revealed that there were some problems with identifying the actual place of occurrence. For example, the coding of falls that occur on farms may actually be coded as occurring at home. A fall in a nursing home may also be coded as a fall occurring at home. This study was not able to tease out these differences.

This research has provided new information about falls among seniors including the number of falls and trends. There has been a decrease in the rate of fall episodes during the study period; however, the proportion of fall-related hospitalizations did not decrease during the study period. This suggests that those aged 65 years and older are more likely to require hospitalization when they fall.

There were significant differences among the episode rates by age groups. The average rates increased from 7.1 for the 65-69 age group to 77.6 per 1,000 individuals in the 95 and over age group. This association with age is consistent with findings elsewhere (3,12).

Female seniors were twice as likely to be hospitalized than males. A study in British Columbia also found that fall hospitalizations among females were approximately twice those of males (49).

Over 70 percent of falls among seniors occurred at home or in a residential institution. This has implications for prevention, suggesting that the home is not as safe as it could be and that modification to homes may be needed. Only a small percentage of falls occurred on farms in Saskatchewan. However, the number of fall-related hospitalizations may have been underestimated by the coding of falls that occur on a farm as falls occurring at home. Also, as the number of farmers who continue to farm into their senior years increases, the number of falls on farms may also increase. Seniors who continue to farm are at increased risk of falling due to their exposure to a variety of extrinsic risk factors. Efforts should be made to continue to monitor the number of falls and the associated places of occurrence.

There was no significant difference observed among the seasons. This is in contrast to findings published by the Canadian Institute for Health Information that the majority of falls happen during the winter months (50). Over half of the fall-related injuries resulted in emergency admissions.

The average length of stay in hospital provides an indication of the serious outcomes and substantial direct costs involved with falls among seniors. Almost half of those hospitalized for a fall had a LOS of more than 10 days (Table 10).

There were variations in fall episode rates (both crude and age-sex standardized) among the health districts. The crude rate was reported because it shows the actual experience or burden of falls among seniors. The age-sex adjusted or

standardized rate was also reported to permit a fair comparison among health districts that may have different proportions of seniors. In this report, the age-sex standardized rate was very similar to the crude rate in most instances. This indicates that the proportion of seniors in these particular health districts was similar to the proportion in the province in 1994. Where there are large differences between crude and standardized rates, this would indicate that there was a large difference between the proportion of seniors in the district and the province. For example, the high age-sex adjusted rates in the northern health districts are a reflection of both the low proportion of seniors in these districts and the relatively large number of falls among these seniors.

Statistical testing was done to determine whether the differences in adjusted rates observed between individual health districts and the provincial average were statistically significant. There were no statistical differences found, although it should be noted that those districts with high rates tended to have small population numbers and this in turn limited the power to detect statistically significant differences. However, the crude rates remain valid and should be used as the basis for any programming decisions.

There are some limitations to this study that need to be identified. The information contained in the hospital separation database is quite comprehensive and allowed the investigation of many factors such as age, gender, seasonality, place of occurrence, and lengths of stay. However, it is evident that these factors will not provide a complete description of factors associated with falls among seniors.

Other factors that have been associated with falls that were not investigated in this study include use of medication (14), mobility impairment (15) and cognitive impairment (1). We have no information on extrinsic factors, such as features of the physical environment including poor lighting, stairs and a lack of handrails. Also, there is no information on falls among seniors that did not result in a hospital stay such as emergency or outpatient visits. It is estimated that less than 10% of all fall-related injuries result in admissions.

Future research may focus on other administrative data sources that yield additional information on the incidence and nature of falls among seniors, including emergency medical services data and death registration data. The use of additional data sources can help to determine more precise incidence estimates and provide more information about the factors associated with falls. Continued research in this area and partnerships with stakeholders are essential steps in the prevention of falls among seniors in Saskatchewan.

In an effort to improve the utilization of the findings and to achieve the goal of reductions in the incidence of falls among seniors, attempts were made during the initial stages of the research to foster partnerships. As a result of these efforts, the Saskatchewan Coalition for Fall Prevention among Seniors was formed to discuss the research and disseminate the findings.

Seniors represent a substantial percentage of the Saskatchewan population. As Saskatchewan's population continues to age, falls will carry an even greater burden of morbidity and mortality. The cost of falls is high both to individuals and to the community. Since many falls are preventable, the payoff for investing in effective intervention programs could be substantial.

POLICY IMPLICATIONS

Health districts and other stakeholders can take advantage of the findings summarized in this report to plan prevention and intervention programs.

It is well established that many falls and related injuries among seniors can be prevented (1,17). Interventions such as the removal of environmental hazards in homes and the promotion of safe footwear use in the winter significantly reduced fall fractures in Norway (15). Improvements of environmental factors such as stairs, lighting, railings and walking surfaces have potential for reducing the incidence and severity of falls (15). Exercise improves balance and strength and reduces the number of falls and injuries (18). Interventions targeting both intrinsic and extrinsic risk factors of individual patients have proven to be most effective (53).

The information provided such as numbers of falls occurring, district rates, sex and age group differences, and trends can be used to justify new fall prevention programs or to help tailor existing programs. This information can also be used to evaluate existing initiatives. In addition, stakeholders could use these research findings to garner increased awareness in specific population subgroups on falls among seniors. For example, the results suggest a focus on strategies that are aimed at women, meeting the needs of seniors of various age groups and northern residents. There is also the need to improve home safety by removing tripping hazards and using non-slip mats in bathtubs and on shower floors. The limitations of the study point to the need for improved monitoring of fall injuries.

The results of the study demonstrate that fall injury prevention strategy is not only essential, but also an integral fight against the burden of unintentional injuries among the seniors' population in the province. It is time to acknowledge that injuries sustained by falls are predictable and preventable. Injuries due to falls are not accidents, and investing in injury prevention can prevent suffering and disability, and ultimately save money and lives.

Interventions, such as the removal of environmental hazards in homes and the promotion of safe footwear use in the winter, have reduced fall fractures significantly.

Exercise improves balance and strength and reduces the number of falls and injuries.

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